MICROBIOLOGICAL REVIEWS

VOLUME 55 ● DECEMBER 1991 ● NUMBER 4

WOLFGANG K. JOKLIK, Editor (1995)

Duke University Medical Center Durham, NC

EDITORIAL BOARD

Franklin M. Harold (1991) Alan G. Hinnebusch (1992) Frederick C. Neidhardt (1991)

Catherine L. Squires (1991)

Eric J. Stanbridge (1991) James T. Stalev (1992) O. C. Yoder (1991)

Barbara H. Iglewski, Chairman, Publications Board Linda M. Illig, Director, Journals Linda M. Illig, Production Editor

Microbiological Reviews considers for publication both solicited and unsolicited reviews and monographs dealing with all aspects of microbiology. Manuscripts, proposals, and correspondence regarding editorial matters should be addressed to the Editor, Wolfgang K. Joklik, Department of Microbiology and Immunology, P.O. Box 3020, Duke University Medical Center, Durham, NC 27710.

Microbiological Reviews (ISSN 0146-0749) is published quarterly (March, June, September, and December), one volume per year, by the American Society for Microbiology. The nonmember subscription prices are \$115 (U.S. and Canada) and \$125 (foreign; air drop shipping) per year; single copies are \$40. The member subscription prices are \$20 (U.S. and Canada) and \$32 (foreign; air drop shipping) per year; single issues are \$10. Correspondence relating to subscriptions, reprints, defective copies, availability of back issues, lost or late proofs, and general editorial matters should be directed to the ASM Journals Division, 1325 Massachusetts Ave., N.W., Washington, DC 20005-4171 (phone: 202 737-3600).

Claims for missing issues from residents of the United States, Canada, and Mexico must be submitted within 3 months after publication of the issues; residents of all other countries must submit claims within 6 months of publication of the issues. Claims for issues missing because of failure to report an address change or for issues 'missing from files' will not be allowed.

日本:価格は外貨表示とは関係なく円建。

Second-class postage paid at Washington, DC 20005, and at additional mailing offices.

POSTMASTER: Send address changes to *Microbiological Reviews*, ASM, 1325 Massachusetts Ave., N.W., Washington, DC 20005-4171.

Made in the United States of America. Printed on acid-free paper.

Copyright © 1991, American Society for Microbiology.

All Rights Reserved.

The code at the top of the first page of an article in this journal indicates the copyright owner's consent that copies of the article may be made for personal use or for personal use of specific clients. This consent is given on the condition, however, that the copier pay the stated per-copy fee through the Copyright Clearance Center, Inc., 21 Congress St., Salem, MA 01970, for copying beyond that permitted by Sections 107 and 108 of the U.S. Copyright Law. This consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale.

AUTHOR INDEX VOLUME 55

Adam, Rodney D., 706 Alonso, Juan C., 675

Bascomb, Shoshana, 335
Baumann, Linda, 425
Baumann, Paul, 425
Benach, Jorge L., 21
Benziman, Moshe, 35
Beveridge, Terry J., 684
Bhakdi, Sucharit, 733
Braun, Phyllis C., 1
Braus, Gerhard H., 349
Bravo, Alicia, 675
Bremer, Hans, 459
Broadwell, Andrew H., 425
Buller, R. Mark L., 80

Calderone, Richard A., 1 Cedar, Howard, 451 Chapalamadugu, S., 59 Chaudhry, G. Rasul, 59 Churchward, Gordon, 459 Clark, Marta A., 425 Cole, Stewart T., 621 Collado-Vides, Julio, 371 Cooper, Stephen, 649 Crosa, Jorge H., 437

Dubnau, David, 395

Farber, J. M., 476 Farr, Spencer B., 561 Fogarty, Andrew M., 225

Gilkes, N. R., 303 Graham, Lori L., 684 Gralla, Jay D., 371

Hale, Thomas Larry, 206 Henrissat, B., 303 Kaneda, Toshi, 288 Kilburn, D. G., 303 Kneifel, Wolfgang, 335 Kogoma, Tokio, 561

Lane, Leslie C., 586 Lovley, Derek R., 259

Magasanik, Boris, 371 Manafi, Mohammed, 335 Marr, Allen G., 316 Mayer, Raphael, 35 Meighen, Edward A., 123 Meints, Russel H., 586 Miller, R. C., Jr., 303 Moulder, James W., 143

Orlowski, Michael, 234

Palumbo, Gregory J., 80

Peterkin, P. I., 476

Razin, Aharon, 451 Rood, Julian I., 621 Ross, Peter, 35

Steffy, Kevin, 193 Szczepanski, Andrew, 21

Tranum-Jensen, Jørgen, 733 Tuovinen, Olli H., 225

Van Etten, James L., 586 Villarreal, Luis P., 512 Viret, Jean-François, 675 Voelker, Dennis R., 543

Warren, R. A. J., 303 Waters, Virginia L., 437 Wong-Staal, Flossie, 193

SUBJECT INDEX VOLUME 55

Adherence
C. albicans, 1
Alpha-toxin
S. aureus, 733
Aromatic amino acid biosynthesis
S. cerevisiae, 349

Bacillus sphaericus
mosquito pathogen, 425
Bacillus subtilis
genetic competence, 395
Bacterial cellulose, 35
Bacterial diagnostics
enzyme substrates, 335
Bioluminescence
molecular biology, 123
Borrelia burgdorferi
host responses, 21
lyme borreliosis, 21

Candida albicans adherence, 1 receptors, 1 Cell surface synthesis division cycle, 649 gram-negative bacteria, 649 Cellulose biosynthesis, 35 function, 35 Chlamydiae host cell interation, 143 Chromosome replication E. coli, 459 Clostridium perfringens genetics, 621 pathogenesis, 621 Colicin V virulence plasmids, 437 Committed gene expression eukaryotic DNA, 512 Composting pesticide degradation, 225

Dissimilatory Fe(III) and Mn(IV) reduction, 259
Division cycle
cell surface synthesis, 649
gram-negative bacteria, 649

DNA committed gene expression, 512 differentiation, 512 eukaryotic, 512 gene expression, 451 methylation, 451 replication, 512

Enzyme substrates and bacterial diagnostics, 335

Escherichia coli
control site location, 371
cyclic chromosome replication, 459
growth, 316
oxidative stress, 561
transcriptional regulation, 371

Eukaryotes
lipid transport, 543
organelle biogenesis, 543

Eukaryotic algae
viruses, 586
viruslike particles, 586

Fatty acids, 288 Fe(III) reduction, 259

Genetic competence
B. subtilis, 395
Giardia biology, 706
β-1,2-Glycanase domains, 303

Halogenated organic compounds biodegradation, 59 Human immunodeficiency virus genetic regulation, 193

Iso- and anteiso-fatty acids, 288

Lipid transport eukaryotes, 543 Listeria monocytogenes, 476 Lyme borreliosis host responses to B. burgdorferi, 21

Mn(IV) reduction, 259 Mosquito pathogen B. sphaericus, 425 Mucor dimorphism, 234

Organelle biogenesis eukaryotes, 543 Oxidative stress E. coli, 561 S. typhimurium, 561

Pesticide degradation
yard waste composting, 225
Plasmids
colicin V, 437
recombination-dependent concatemeric
replication, 675
Poxvirus pathogenesis, 80

Receptors
C. albicans, 1
Replication
plasmids, 675
Rolling-circle replication, 675

Saccharomyces cerevisiae
aromatic amino acid biosynthesis, 349
Salmonella typhimurium
oxidative stress, 561
Shigella spp.
virulence, 206
Staphylococcus aureus
alpha-toxin, 733
Surface layers of bacteria, 684

Transcriptional regulation E. coli, 371

Virulence plasmids colicin V, 437 Viruses eukaryotic algae, 586 Viruslike particles eukaryotic algae, 586



Statement of Ownership, Management and Circulation

A. Title of Publication 18. PUBLICATION NO. 2. Date of Filing									
Microbiological Reviews	0 1 4 6 0 7	4 9 10-30-91							
3. Frequency of Issue	3A. No. of Issues Published Annually	3B. Annual Subscription Price							
Quarterly	4 \$20 mbr, \$115 nonn								
4. Complete Mailing Address of Known Office of Publication (Street, City, County, State and ZIP+4 Code) (Not printers)									
American Society for Microbiology 1325 Massachusetts Ave., N.W., Washington, DC 20005-4171									
5. Complete Mailing Address of the Headquarters of General Business Officer									
(Same as above)									
6. Full Names and Complete Mailing Address of Publisher, Editor, and Manag	ng Editor (This item MUST NOT be blank)								
Publisher (Name and Complete Mailing Address) (Same as above)									
Editor (Name and Complete Mailing Address)									
Wolfgang K. Joklik (Address same as above)									
(Address same as above) Meneging Editor (Name and Complete Mailing Address)									
Linda M. Illig (Address same as above)									
(Address same as above) 7. Owner (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding									
I percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given. If the publication is published by a nonprofit organization, its name and address must be stated.) (Item must be completed.)									
Full Name	Complete Mail								
American Society for Microbiology	1325 Massachusetts Ave Washington, DC 20005-4								
Known Bondholders, Mortgagees, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages or Other Securities (() there are none, so state)									
Full Name	Complete Mailing Address								
NONE									
•									
O. See Completion by Nepperalit Connections Authorized To Mail at Special	Rates (DMM Section 424 12 only)								
9. For Completion by Nonprofit Organizations Authorized To Mail at Special The purpose, function, and nonprofit status of this organization and the e	Rates (DMM Section 424.12 only) empt status for Federal income tax purp	ooses (Check one)							
The purpose, function, and nonprofit status of this organization and the e (1) (2)	empt status for Federal income tax purp (If changed, pi	iblisher must submit explanation of							
The purpose, function, and nonprofit status of this organization and the e (1) (2) Has Not Changed During Has Changed During Preceding 12 Months 10. Extent and Nature of Circulation	rempt status for Federal income tax purp (If changed, pi change with th Average No. Copies Each Issue During	ublisher must submit explanation of is statement.) Actual No. Copies of Single Issue							
The purpose, function, and nonprofit status of this organization and the e (1) [X] Has Not Changed During Preceding 12 Months 10. Extent and Nature of Circulation (See instructions on reverse side)	eempt status for Federal income tax purp (If changed, pi change with th Average No. Copies Each Issue During Preceding 12 Months	ublisher must submit explanation of is statement.)							
The purpose, function, and nonprofit status of this organization and the e (1) (2) Has Not Changed During Has Changed During Preceding 12 Months 10. Extent and Nature of Circulation (See instructions on reverse side) A. Total No. Copies (Net Press Run)	rempt status for Federal income tax purp (If changed, pi change with th Average No. Copies Each Issue During	iblisher must submit explanation of is statement.) Actual No. Copies of Single Issue Published Nearest to Filing Date							
The purpose, function, and nonprofit status of this organization and the e (1) (2) Has Not Changed During Has Changed During Has Changed During Preceding 12 Months 10.	eempt status for Federal income tex purp (If changed, pichange with the Average No. Copies Each Issue During Preceding 12 Months 13,325	ablisher must submit explanation of its statement.) Actual No. Copies of Single Issue Published Nesrest to Filing Date 12,800							
The purpose, function, and nonprofit status of this organization and the e (1) (2) Has Not Changed During Has Changed During Preceding 12 Months 10. Extent and Nature of Circulation (See instructions on reverse side) A. Total No. Copies (Net Press Run) B. Paid and/or Requested Circulation 1. Sales through dealers and carriers, street vendors and counter sales 2. Mail Subscription (Paid and/or requested)	empt status for Federal income tax purs (If changed, pr change with it Average No. Copies Each Issue During Preceding 12 Months 13,325 —— 11,722	ablisher must submit explanation of is statement.) Actual No. Copies of Single Issue Published Nearest to Filing Date 12,800 12,013							
The purpose, function, and nonprofit status of this organization and the e (1) (2) Has Not Changed During Has Changed During Preceding 12 Months 10. Extent and Nature of Circulation (See instructions on reverse side) A. Total No. Copies (Net Press Run) B. Paid and/or Requested Circulation 1. Sales through dealers and carriers, street vendors and counter sales 2. Mail Subscription	eempt status for Federal income tex purp (If changed, pichange with the Average No. Copies Each Issue During Preceding 12 Months 13,325	ablisher must submit explanation of is statement.) Actual No. Copies of Single Issue Published Nearest to Filing Date 12,800 12,013							
The purpose, function, and nonprofit status of this organization and the e (1) (2) Has Not Changed During Has Changed During Preceding 12 Months 10. Extent and Nature of Circulation (See instructions on reverse side) A. Total No. Copies (Net Press Run) B. Paid and/or Requested Circulation 1. Sales through dealers and carriers, street vendors and counter sales 2. Mail Subscription (Paid and/or requested) C. Total Paid and/or Requested Circulation	empt status for Federal income tax purs (If changed, pr change with it Average No. Copies Each Issue During Preceding 12 Months 13,325 —— 11,722	ablisher must submit explanation of is statement.) Actual No. Copies of Single Issue Published Nearest to Filing Date 12,800 12,013							
The purpose, function, and nonprofit status of this organization and the e (1)	empt status for Federal income tex purp (If changed, pichange with the Average No. Copies Each Issue During Preceding 12 Months 13,325 —— 11,722 11,722	ablisher must submit explanation of is statement.) Actual No. Copies of Single Issue Published Nearest to Filing Date 12,800 12,013							
The purpose, function, and nonprofit status of this organization and the e (1) (2) Has Not Changed During Preceding 12 Months 10. Extent and Nature of Circulation (See instructions on reverse side) A. Total No. Copies (Net Press Run) B. Paid and/or Requested Circulation 1. Sales through dealers and carriers, street vendors and counter sales 2. Mail Subscription (Paid and/or requested) C. Total Paid and/or Requested Circulation (Sam of 1081 and 1082) D. Free Distribution by Mail, Cerrier or Other Means Samples, Complimentary, and Other Free Copies	empt status for Federal income tax purs (If changed, pr change with it Average No. Copies Each Issue During Preceding 12 Months 13,325 —— 11,722 11,722 21	ablisher must submit explanation of is statement.) Actual No. Copies of Single Issue Published Nearest to Filing Date 12,800 ——————————————————————————————————							
The purpose, function, and nonprofit status of this organization and the e (1)	With the control of t	ablisher must submit explanation of is statement.) Actual No. Copies of Single Issue Published Nearest to Filing Date 12,800 12,013 12,013 21 12,034							
The purpose, function, and nonprofit status of this organization and the e (1)	With the control of t	ablisher must submit explanation of is statement.) Actual No. Copies of Single Issue Published Nearest to Filing Date 12,800 12,013 21 12,034 766 12,800							

1992 APPLICATION FOR FULL MEMBERSHIP IN THE AMERICAN SOCIETY FOR MICROBIOLOGY

1325 Massachusetts Avenue, NW • Washington, D.C. 20005 • (202) 737-3600 • FAX (202) 737-0368

Eligibility		mes to full membersh llogy or a related fie	nip anyone who is interesto Id.	ed in its objectives	and has a	a minimur	n of a bachel	or's degree o	or equivalent	
Initiation	Memberships are initiated and renewed in January each year. Unless there are directions to the contrary, membership nominations received prior to September 1 are credited to the current year, and back issues of the selected publications for the current year are furnished, if available. Nominations received after September 1 will become effective the following January.									
	NAME MISS	S DR.								
	LEONE) MRS	s. mr. 1E	FIRST	INITIA				ST		
			AS YOU WANT IT TO APPEAR ON YOUR MAILING LABEL							
	ADDRESS.	ADDRESS WHERE YOU WANT TO RECEIVE YOUR SUBSCRIPTIONS								
	PHONE ()	STATE/PROVINCE	ZIP/ HOME (02)	POSTAL COI	DE BIRTL	CO	UNTRY	<u> </u>	
	שופשבפד ו	OFFICI	() : (01) SUBJ	HOME (02)	ILAN	ווווט וכ	'	OL	^	
							DATE			
	*NOMINAT	ED BY	SIGNATURE OF ASM MEMBER	MEM	BER #L					
	*If you are no	t associated with an ASN	SIGNATURE OF ASM MEMBER I nominating member, you car	n still apply for memb	pership and	we will con	tact you if there	is a problem		
Member		****	e ASM? (Check one):				enting a par		M mastina	
Information		A colleague	☐ An advertisemer	nt in a iournal		☐ An A	ASM Branch	Der all all Ad	ow meeting	
		A professor	□ Direct mail inqui	ry			lent member		1	
		An ASM journal	☐ A workshop, cor	nference or meet	ing	☐ Non	e of the abo	ve		
Dues	Annual dues for 1992 are \$75. Dues include ASM News (monthly) and a \$51 credit which may be deducted from the total cost of the journal(s) you purchase at the special membership rates indicated below.									
Journals	☐ Please s	end me the followin	ent (U.S. Dollars only) g ASM journal(s) at Mer	mber Price(s): U.S. Ca	nada	Non Air Drop	- U.S. Airmail	Amount		
			therapy						AA	
			biology						AE	
									CB	
									CM	
	Journal of C	Clinical Microbiology		. \$79.00 \$89 . \$46.00 \$4	5.00 \$	0104.00 .	\$439.00			
	Journal of \	/irology	/ · · · · · · · · · · · · · · · · · · ·	. Ф40.00 	9.00 5.00	\$77.00.	\$222.00	-	JV	
	Microbiolog	nv Reviews	• • • • • • • • • • • • • • • • • • • •	. \$79.00 \$6; . \$20.00 \$6;	5.00 \$ 1.00	\$104.00 . \$24.00	\$439.00		MR	
	ASM News	gy 110410443		\$0.00 \$2					IVII	
	In the past, m	embers have been able	to order free programs for				३ठ७.७७ ı rnal Fees \$			
	the General M	leeting and ICAAC Con	erence on the dues renewal ither of these meetings, you	Subtract your				- \$51		
	must register	for the meeting. The co	st of the program is include							
	in the registra	ition fee. For your information f	nation, abbreviated or each meeting will be				enter zero) \$			
	included in AS	SM News.					ship Dues	+ \$75		
,			Total (Dues plus Jo							
	PAYMENT IN U.S. DOLLARS MUST ACCOMPANY APPLICATION A membership card, voting division form, ASM Placement Service Information and the journal(s) of your choice will be sent within 90 days upon completion of processing. ASM dues are tax deductible to the extent permitted by law. ASM designates \$13 of your dues for ASM News. Rates are for 1992 only. Applicants must remit in U.S. Dollars by check or draft payable to ASM through a U.S. bank located within the Continental U.S. Applicants from Canada may use check made out in U.S. Dollars and drawn on a Canadian bank or applicants may choose to pay with VISA, MasterCard, Eurocard, or American Express. If that is your preference, please fill in the box below.									
		□ VISA #					EVD	IDATION	7	
		□ MASTERCARD #					DATI	IRATION E: L MO YB		
	1	□ EUROCARD # 「ODAY'S DATE	DAY YEAR	NAME AS	S IT APPEARS	ON YOUR (CREDIT CARD	IVIO YH		